

## CLAIMS

What is claimed is:

1. A fuel cell stack comprising:
  - a fuel cell having an inlet, a flow field in fluid communication with said inlet and an outlet in fluid communication with said flow field;
  - a vaporized water source in fluid communication with said inlet;
  - a differential pressure transducer repeatedly measuring a differential pressure across said flow field and generating a set of differential pressure signals; and
  - a controller in communication with said differential pressure transducer, said controller having executable logic for determining a differential pressure fluctuation parameter from said set of differential pressure signals and control circuitry for controlling said vaporized water source in response to said differential pressure fluctuation parameter.
2. The fuel cell of Claim 1 wherein said executable logic further comprises executable logic for determining a differential pressure fluctuation parameter as a representative statistical value from said set of differential pressure signals.
3. The fuel cell of Claim 2 wherein said representative statistical value is a root-mean-square value.

4. The fuel cell of Claim 2 wherein said controller further comprises executable logic for comparing said representative statistical value to a threshold variable.

5. The fuel cell of Claim 4 wherein said representative statistical value is a root-mean-square value.

6. The fuel cell of Claim 1 wherein said executable logic further comprises executable logic for determining fluctuation instances in said set of differential pressure signals, a maximum value for each fluctuation instance, a minimum value for each fluctuation instance, and a representative statistical value from said maximum values and said minimum values.

7. The fuel cell of Claim 6 wherein said representative statistical value is a root-mean-square value.

8. The fuel cell of Claim 6 wherein said executable logic further comprises executable logic for comparing said representative statistical value to a threshold variable.

9. The fuel cell of Claim 8 wherein said representative statistical value is a root-mean-square value.

10. A method for operating a fuel cell comprising:

- mixing vaporized water with a gaseous reactant;
- introducing said fluid into a reactant flow field of a fuel cell;
- measuring a set of differential pressures across said reactant flow field;
- determining a differential pressure fluctuation parameter from said set of differential pressures; and
- controlling said vaporized water in response to said differential pressure fluctuation parameter.

11. The method of Claim 10 wherein determining a differential pressure fluctuation parameter comprises:

- identifying fluctuation instances in said set of differential pressures;
- determining a maximum value for each fluctuation instance;
- determining a minimum value for each fluctuation instance; and
- computing a representative statistical value from said maximum values and said minimum values.

12. The method of Claim 11 further comprising comparing a threshold variable to said representative statistical value.

13. The method of Claim 12 further comprising controlling said vaporized water in said two-phase fluid in response to said comparison.

14. The method of Claim 11 wherein said representative statistical value is computed as a root-mean-square value.

15. The method of Claim 10 wherein determining a differential pressure fluctuation parameter defines a representative statistical value from said set differential pressures.

16. The method of Claim 15 wherein said representative statistical value is computed as a root-mean-square value.